Medical injuries in US hospitals cause more than 30 000 deaths each year

Susan Mayor *London*

Medical injuries incurred by patients while in hospital result in longer hospital stays, increased hospital charges, and more than 30 000 deaths each year, a study published this week says (*JAMA* 2003;290:1868-74).

The study analysed patient safety indicators—measures recording incidences related to patient safety while in hospital—from the Agency for Healthcare Research and Quality to identify medical injuries in 7.45 million hospital discharge abstracts from 994 acute hospitals across 28 states for the year 2000. This was equivalent to a 20% stratified sample of non-federal acute hospitals in the United States.

Results were assessed for the impact of medical injuries on length of hospital stay, hospital charges, and deaths attributable to medical injuries during hospitalisation, although the researchers noted that their findings were likely to represent an underestimate compared with other reporting systems for medical injuries.

Results showed that postoperative sepsis—which was recorded in 2595 patients—had the biggest impact, resulting in hospital stays of almost 11 days longer than in patients without this complication. This increased charges by $57 727 (£34 700; €49 000) per patient and the risk of death after surgery by 21.9%.

On the basis of these findings, the researchers estimated that about 3000 Americans died each year due to postoperative sepsis. The next most serious medical injury was postoperative reopening of a surgical incision, resulting in an average increase in hospital stay of 9.4 days, $40 323 in added charges, and a 9.6% increase in the risk of death. Infection due to medical care was associated with 9.58 extra days of hospital stay, $8656 in excess hospital charges, and 4.31% attributable mortality.

Carolyn Clancy, director of the Agency for Healthcare Research and Quality, said: "This study gives us the first direct evidence that medical injuries pose a real threat to the American public and increase the charges of health care. The nation's hospitals can use this information to enhance the efforts they are already taking to reduce medical errors and improve patient safety."

One of the research group members, Chunliu Zhan, also from the agency, added: "Although medical injuries are recognised as a major hazard in the healthcare system, there has previously been little information on their impact. This study shows that some injuries incurred during hospitalisation pose a significant threat to patients and costs to society. We need more research to identify why medical injuries occur and find ways to prevent them from happening."

In an accompanying editorial in *JAMA* (pp 1917-9), Saul Weingart, assistant professor of medicine, and Lisa Iezzoni, professor of medicine, both from Harvard Medical School, Boston, argued that clear measures and definitions of medical injuries were needed before the problem could be improved. They suggested that developing and validating a robust set of measurement tools was essential to "move patient safety information out of the shadows and into the light," pointing out that these should focus on preventable injuries in order to be maximally useful. □

Air pollution during warm weather increases risk of stroke

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High levels of air pollution, coupled with warm weather, increase ischaemic and haemorrhagic strokes by about 50%, says a study from Kaohsiung Medical University in Taiwan, published online before print in *Stroke* (www.strokeaha.org).

The study used a crossover approach to evaluate data on 23 179 admissions to hospital for stroke from 1997 to 2000. It used computerised data from Taiwan's national health insurance plan, which covers 96% of the population, and data from six automated pollution monitoring stations in Kaohsiung.

Kaohsiung, a city of about 1.5 million, is Taiwan's main commercial port and second largest city. It is the centre of Taiwan's heavy industry, with steel, ship building, and petrochemical plants. The city has a tropical climate. In this study warm days were considered to be those with temperatures of ≥20°C.

Previous studies showed that increased mortality and hospital admissions resulting from air pollution were associated with high levels of pollution on the same day or the previous two days. Therefore, these investigators compared air pollution levels on the date of admission with levels one week before and one week after admission. They found that particulate matter and nitrogen dioxide were the most important pollutants and that their effects were strongest on warm days.

"The sources of nitrogen dioxide and particulate matter are the same: industry and motor vehicle exhaust," said the lead author, Professor Chun-Yuh Yang, dean of the Institute of Public Health at the university.

Admissions for both types of stroke were higher on days when particulate matter and nitrogen dioxide were high. The researchers wrote: "We observed estimated relative risks of 1.54 (95% confidence interval, 1.31 to 1.81) and 1.56 (95% CI, 1.32 to 1.84) for primary intracerebral hemorrhage for each interquartile range increase in PM_{10} [particulate matter] and NO_2 [nitrogen dioxide]. The values for ischemic stroke were 1.46 (95% CI, 1.32 to 1.61) and 1.55 (95% CI, 1.40 to 1.71), respectively."

How increased pollution causes stroke is not clear. Dr Yang said that "increased plasma viscosity, increased risk of high heart rate, and increased heart rate variability could affect risk of both types of stroke." He added: "Warmer weather increases the effect of higher pollutant levels on stroke risk."

Dr Yang said, "The temperature range in Kaohsiung is quite different from that in most other cities where such studies have been done. Kaohsiung does not really have very cold days (below 10°C)… This is the opposite of the situation in many other cities where this type of study has been done." Interaction of pollutants and temperature is complicated and needs to be studied further, he said.

The combination of heat and pollution may have led to the high number of deaths from coronary heart disease and stroke during the heat waves in France this summer and in Chicago several years ago, explaining the increase in mortality, Professor Yang said. □

CHRIS STOWERS/PANOS

Bikers protect themselves from pollution in Kaohsiung